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Update on EPA's Arsenic Removal Technology Demonstration Program

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Timelines and Major Events

1975	SDWA set As MCL at 0.05 mg/L
1996	SDWA amended to require EPA to develop an As research strategy and publish proposal to revise As MCL by 01/00
02/98	EPA published Arsenic Research Plan
01/22/01	EPA finalized As MCL at 10 µg/L
10/31/01	EPA Administrator announced As final standard as 10 µg/L and pledged to provide $20 M for R&D of more cost-effective technologies and technical assistance and training to operators of small systems (Arsenic Rule Implementation Research Program)
03/25/03	EPA revised rule text to express MCL as 0.010 mg/L
02/22/06	Final rule to become effective
02/23/06	Final rule to be enforced

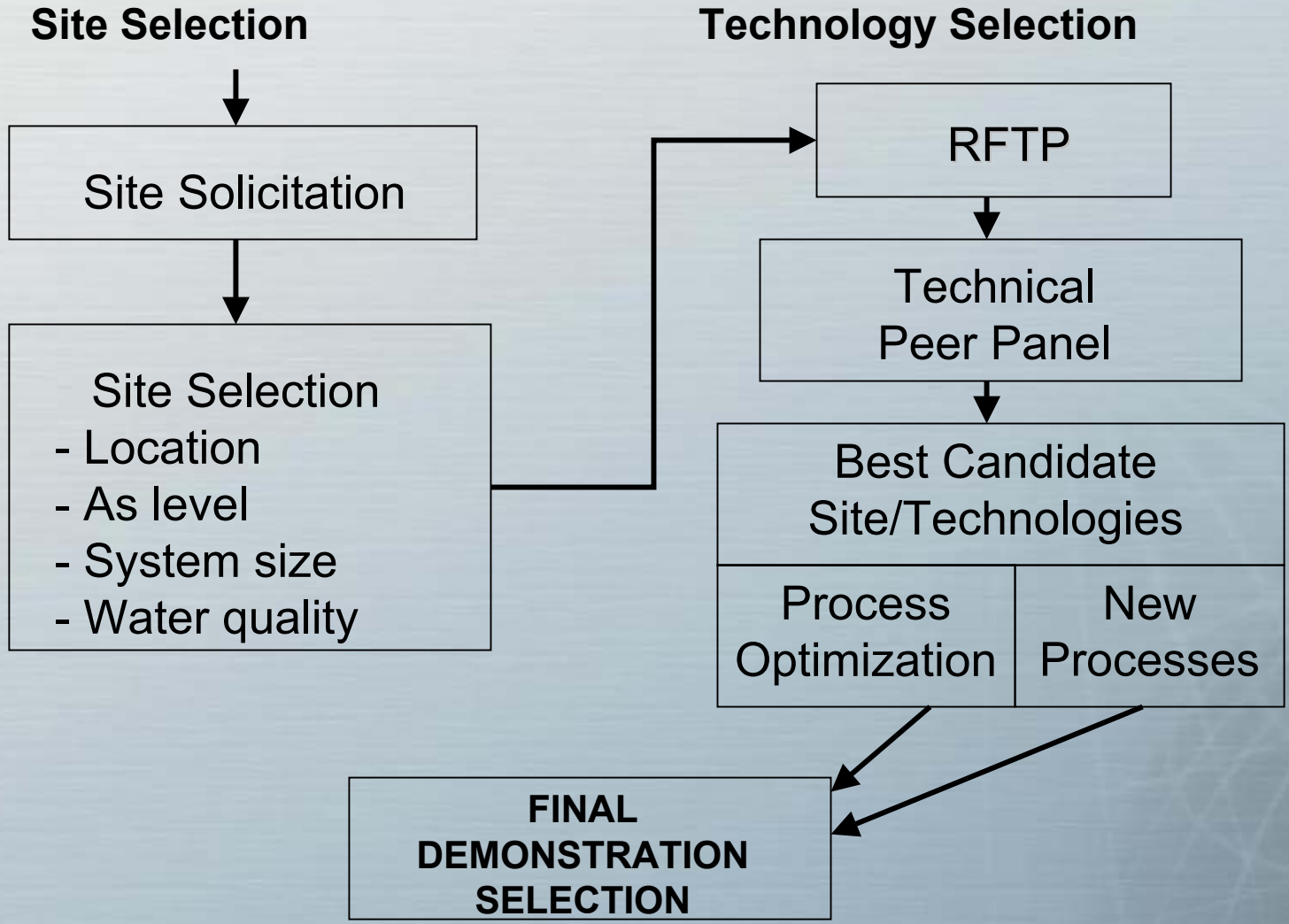
EPA Arsenic Removal Technology Demonstration Program

- Round 1: 12 sites
- Round 2: 31 sites
- Full-scale, long-term (1 year) in scope
- Focused on commercially ready technologies or engineering approaches

Goals of Demonstration

- Determine/document construction costs/operational costs of the new system or the modifications of existing systems to achieve compliance
- Determine/document performance of the new process or process modifications of existing treatment for 1 year in achieving compliance
- Determine the operational and maintenance requirements of treatment system
- Characterize the residuals produced by the process; quantity and chemical characteristics
- Evaluate impact of the treatment process on the distribution system

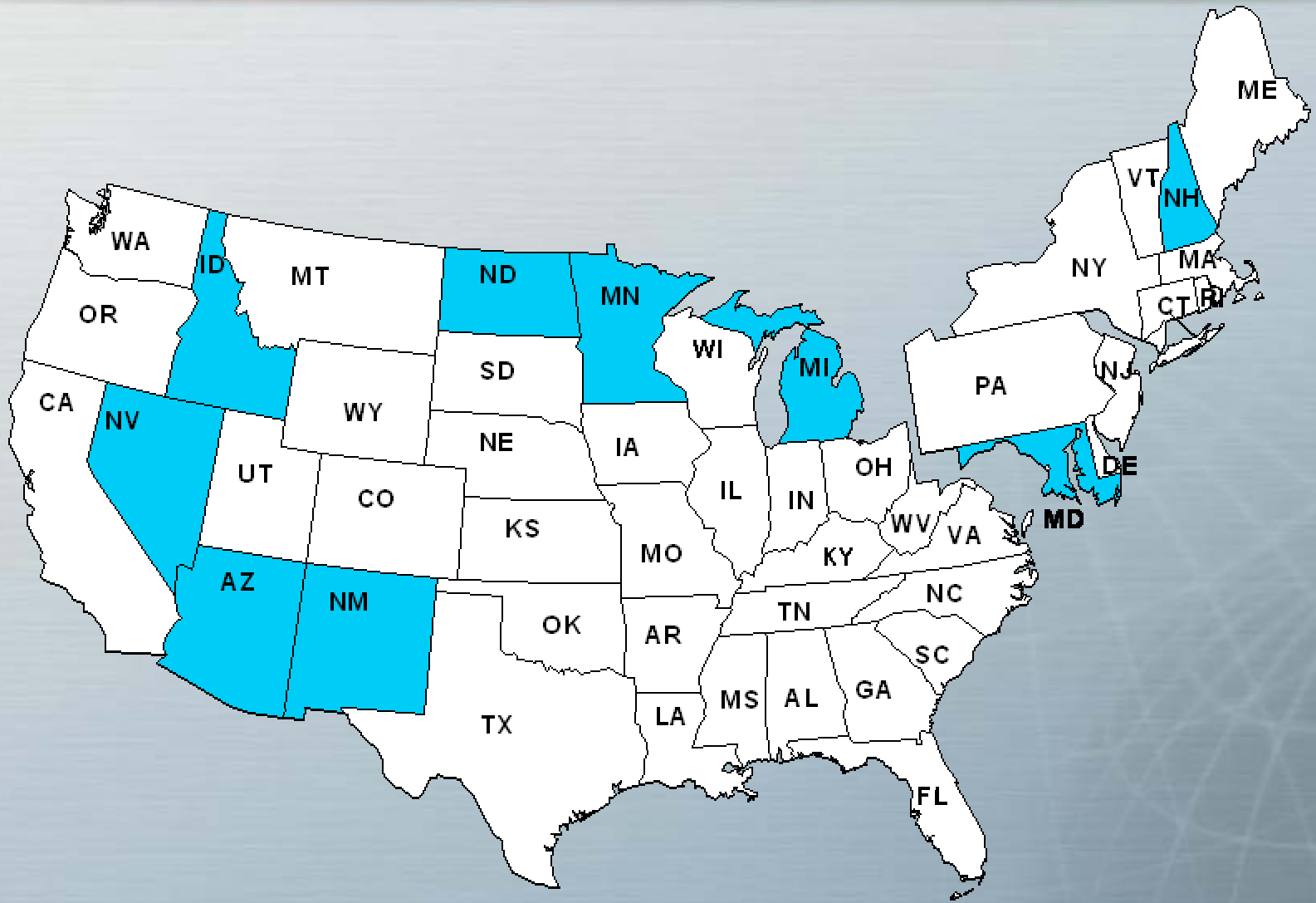
Selection Process



Major Activities

- Conduct Introductory meeting with EPA, State drinking water official(s), facility, vendor, and engineering firms
- Issue Letter of Understanding
- Issue study plan
- Establish contract(s) with vendor for equipment/system engineering, site engineering, installation/shakedown, and operator training, and coordinate O&M and troubleshoot needs
- Obtain permit(s)
- Oversee system installation/shakedown
- Provide operator training for sampling and on-site measurements and As speciation
- Track system performance for one year with weekly sampling and monthly As speciation
- Prepare progress reports to EPA/prepare reports for Office of Budget and Management
- Prepare final technology evaluation report

Round 1 – 12 Sites in 9 States



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Summary of Round 1 Sites

- States – 9
- Sites per state - 1 to 2
- CWS – 12
- NTNCWS – 0
- Multi contaminant sites– 1 (As, nitrate)
- Size – 37 to 640 gpm

Technologies Selected/Evaluated

- Adsorptive media system (9)
  - Iron-based media: E 33 (6), GFH (1), G2 (1)
  - Alumina-based media: AAFS (1)
- Anion exchange system (1)
- Iron removal system (1)
- System modification (1)
  - Iron removal process: iron addition

Sites/Technologies Evaluated

State	Facility	Technology	Vendor	Flowrate (gpm)	Conc. (µg/L)/Unit		
					As	Fe	pH
NH	Bow	G2	ADI	70	39	<25	7.7
NH	Rollinsford	E33	AE	100	36	46	8.2
MD	Queen Anne's County	E33	STS	300	19	270	7.3
MI	Brown City	E33	STS	640	14	127	7.3
MN	Climax	C/F	K	140	39	546	7.4
ND	Lidgerwood	SM	K	250	146	1,325	7.2
NM	Desert Sands MDWCA	E33	STS	320	23	39	7.7
NM	Nambe Pueblo	E33	AE	145	33	<25	8.5
AZ	Rimrock	E33	AE	90	50	170	7.2
AZ	Valley Vista	AAFS	K	37	41	<25	7.8
ID	Fruitland	IX	K	250	44	<25	7.4
NV	STMGID	GFH	USF	350	39	<25	7.4

AE = AdEdge; K = Kinetico; STS = Severn Trent Services; USF = USFilter;
MDWCA = Mutual Domestic Water Consumer's Association;STMGID = South Truckee Meadows General Improvement District

Adsorptive Media Systems Design

Media Type	Site	Media Vessels			Media Volume per Vessel (ft^3)	EBCT at Design Flow (min)
		No.	Configu-ration	Material		
G2	Bow, NH	2	Series	SS	85	18[(a)]
E33	Desert Sands MDWCA, NM	2	Parallel	FRP	80	3.7
E33	Brown City, MI	4	Parallel	FRP	80	3.7
E33	Queen Anne's County, MD	2	Parallel	FRP	80	4.0
E33	Nambe Pueblo, NM	3	Parallel	FRP	27	4.2
E33	Rimrock, AZ	2	Series	FRP	27	4.5[(a)]
E33	Rollinsford, NH	2	Parallel	FRP	27	4.0
GFH	STMGID, NV	3	Parallel	CS	80	5.1
AAFS50	Valley Vista, AZ	2	Series	FRP	22	4.4[(a)]

(a) EBCT is for one vessel only.

Pre and Post-Treatment

Media Type	Site	Pre-Cl_2	Pre-pH Adjustment	Post-Cl_2	Post-pH Adjustment
G2	Bow, NH	Yes	H_2SO_4	No	NaOH
E33	DSMDWCA, NM	Yes	No	No	No
E33	Brown City, MI	No	No	Yes	No
E33	QAC, MD	No	No	Yes	No
E33	Nambe Pueblo, NM	Yes	CO_2	No	No
E33	Rimrock, AZ	Yes	No	No	No
E33	Rollinsford, NH	Yes	CO_2	No	No
GFH	STMGID, NV	No	No	Yes	No
AAFS50	Valley Vista, AZ	Yes	H_2SO_4	No	No

Round 1 Status

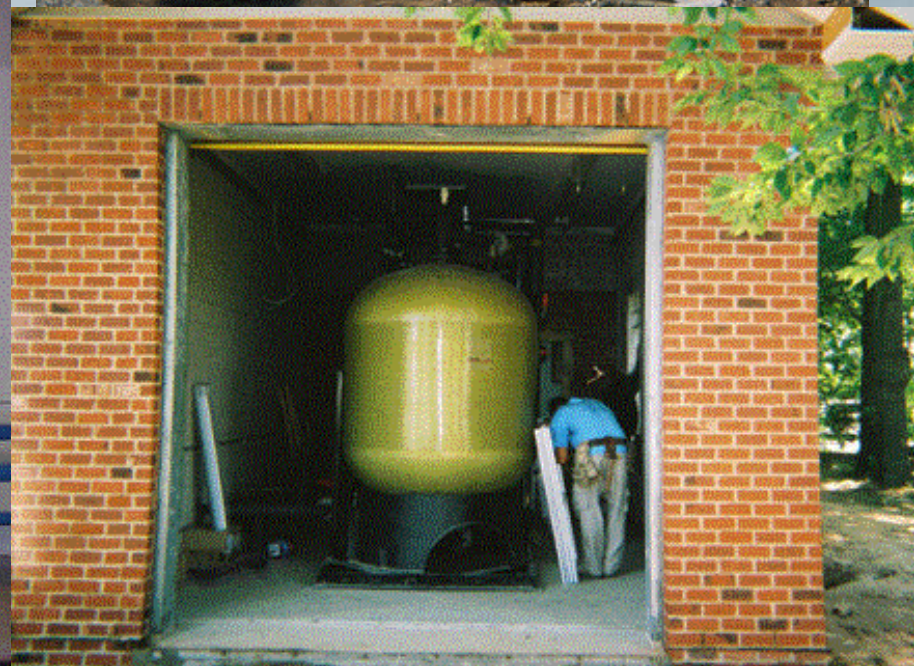
- 8 systems operational
- 1 system under iron-addition testing (Lidgerwood, ND)
- 1 system installation complete (Fruitland, ID)
- 2 systems to be installed/tested by end of year (Nambe Pueblo, NM and STMGID, NV)

APU-300 Systems

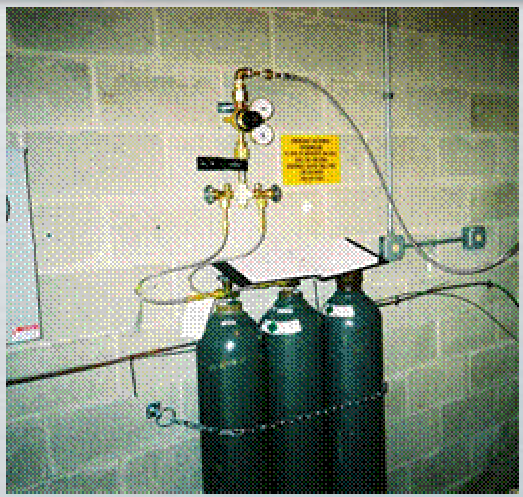
Top: Desert Sands MDWCA, NM

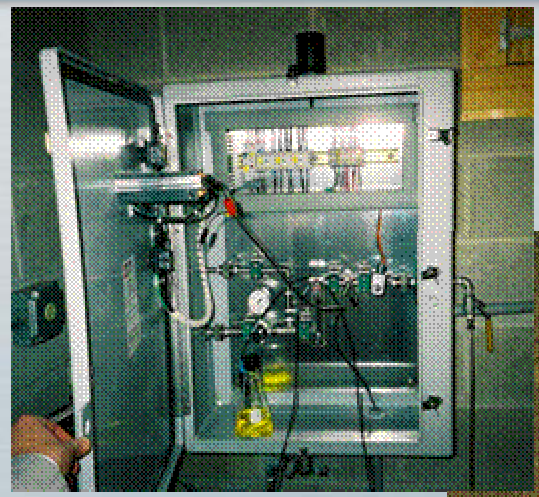
Right: Queen Anne's County, MD

Left: Brown City, MI



APU-100 System at Rollinsford Site





G2 System at Bow Site

AAFS50 System at Valley Vista Site

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Anion Exchange and C/F Systems

Right: Fruitland, ID

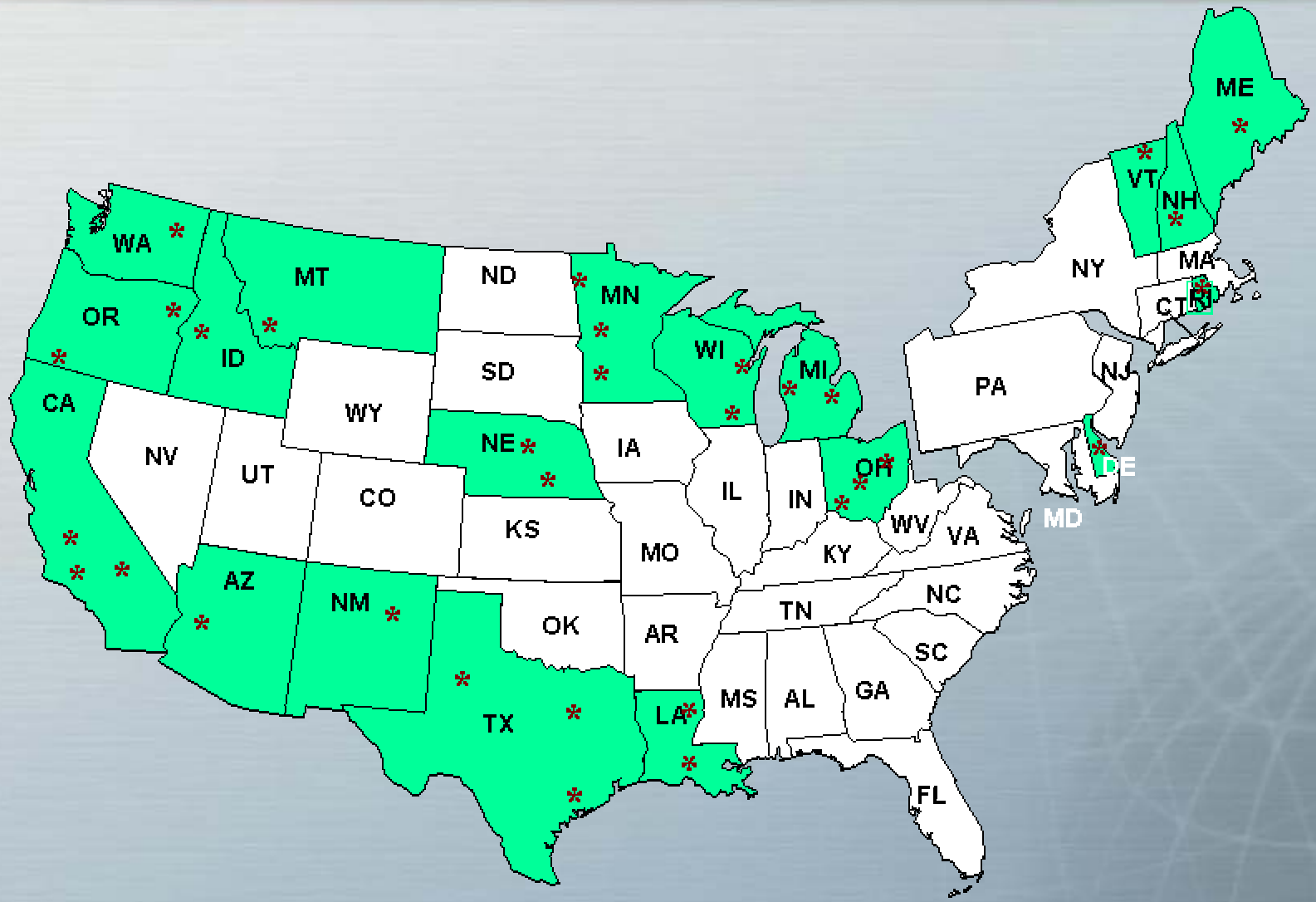
Left: Climax, MN

System Modification at Lidgerwood Site

Residuals Generation and Disposal

Technology	Site	Spent Media (ft^3)	Backwash Water (kgal) (Bed Volume)	Backwash Water Disposal
G2	Bow, NH	170	2.3 – 3.4 (2 – 3 BV)	Surface leach field
E33	DSMDWCA, NM	160	12 – 18 (10 – 15 BV)	Holding pond
E33	Brown City, MI	320	24 – 36 (10 – 15 BV)	Ditch
E33	QAC, MD	160	12 – 18 (10 – 15 BV)	Off-site disposal
E33	Nambe Pueblo, NM	81	6.1 – 9.1 (10 – 15 BV)	Holding pond
E33	Rimrock, AZ	54	4 – 6 (10 – 15 BV)	Recycling
E33	Rollinsford, NH	54	4 – 6 (10 – 15 BV)	Subsurface septic system
GFH	STMGID, NV	240	13 – 17 (7 – 10 BV)	Sanitary sewer
AAFS50	Valley Vista, AZ	44	1.1 – 1.4 (3 – 4 BV)	Recycling
C/F	Climax, MN	N/A	1.6 – 2.0	Sanitary sewer
IX	Fruitland, ID	N/A	7 – 10	Sanitary sewer
SM	Lidgerwood, ND	N/A	9.6	Recycling

Round 2 – 31 Sites in 19 States



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Round 2 Demonstration Sites

East	Central Midwest	Midwest	Far West
Felton, DE	Grove City, OH	Arnaudville, LA	Tohono O'odham Nation, AZ (Sells)*
Wales, ME	Newark, OH	Lyman, NE	Lake Isabella, CA
Goffstown, NH	Springfield, OH	Stromsburg, NE	Susanville, CA
N. Springfield, RI	Pentwater, MI	Alvin, TX	Techachapi, CA*
Dummerston, VT	Sandusky, MI	Bruni, TX	Homedale, ID
	Sabin, MN*	Wellman, TX*	Three Forks, MT
	Sauk Centre, MN		Klamath Falls, OR
	Stewart, MN		Vale, OR
	Delavan, WI		Taos, NM
	Greenville, WI*		Okanogand, WA
(5)	**(10)**	**(6)**	**(10)**

* Site selected, but not funded in Round 1

Summary of Round 2 Sites

- States – 19
- Sites per State - 1 to 3
- CWS – 28
- NTNCWS – 4
- Multi contaminant sites – 4 (As, U, gross alpha, nitrate)
- Size – 7 to 600 gpm

Changes from Round 1

- Includes non-transient non-community water systems (NTNCWS)
- Allows for demonstration of POU/POE approaches
- Multi-contaminant treatment

Round 2 Technologies

- Proposals received – 148
- Companies – 24
- Proposals per site – 2 to 8
- Technology proposed
  - *Adsorption technologies*
  - Oxidation/filtration
  - Iron coagulation/filtration
  - Reverse osmosis
  - Ion exchange
  - Process modification
  - Dissolved air flotation/filtration
  - Distillation

**POUs (included in above technologies)

Round 2 Status

- Introductory meetings for technology selection held at 19 sites
- Project planning meetings held at 5 sites to define roles and responsibilities
- Draft Letter of Understanding issued for 2 sites

Further Information

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